CLAIMS

What is claimed is:

1. A method for generating a tomographic image of an object comprising

5   probing the object with incident scalar waves,

detecting scattered waves from the object, wherein the scattered waves are

detected in a near-field collection mode, and

reconstructing the tomographic image by executing a prescribed

mathematical algorithm with reference to the incident scalar waves and the scattered

10   waves to generate the tomographic image with sub-wavelength spatial resolution.

2. A method for generating a tomographic image of an object comprising

illuminating the object with a source of incident scalar waves,

measuring scattering data from the object, wherein the scattering data is

15   measured in a near-field collection mode and is related to the object by an integral

operator, and

reconstructing the tomographic image by executing a prescribed

mathematical algorithm, determined with reference to the integral operator, on the

scattering data to produce the tomographic image with sub-wavelength spatial resolution.

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3. The method as recited in claim 2 wherein the scattering data is related to the

scattering potential of the object by the integral operator, and wherein the reconstructing

includes reconstructing the tomographic image by executing the prescribed mathematical

algorithm, determined with reference to the integral operator, on the scattering data, the prescribed mathematical algorithm further relating the scattering potential to the scattering data by another integral operator.

5   4. A method for generating a tomographic image of an object comprising

probing the object with incident scalar waves, wherein the incident scalar waves are generated in a near-field illumination mode,

detecting scattered waves from the object, wherein the scattered waves are detected in the far-field of the object, and

10   reconstructing the tomographic image by executing a prescribed mathematical algorithm with reference to the incident scalar waves and the scattered waves to generate the tomographic image with sub-wavelength spatial resolution.

5. A method for generating a tomographic image of an object comprising

15   illuminating the object with a source of incident scalar waves, wherein the incident scalar waves are generated in a near-field illumination mode,

measuring scattering data from the object, wherein the scattering data is measured in the far-field of the object and is related to the object by an integral operator, and

20   reconstructing the tomographic image by executing a prescribed mathematical algorithm, determined with reference to the integral operator, on the scattering data to produce the tomographic image with sub-wavelength spatial resolution.

6. The method as recited in claim 5 wherein the scattering data is related to the scattering potential of the object by the integral operator, and wherein the reconstructing includes reconstructing the tomographic image by executing the prescribed mathematical algorithm, determined with reference to the integral operator, on the scattering data, the

5   prescribed mathematical algorithm further relating the scattering potential to the scattering data by another integral operator.

7. A method for generating a tomographic image of an object comprising

probing the object with incident scalar waves, wherein the incident scalar

10   waves are generated in a near-field illumination mode,

detecting scattered waves from the object, wherein the scattered waves are detected in a near-field collection mode, and

reconstructing the tomographic image by executing a prescribed mathematical algorithm with reference to the incident scalar waves and the scattered

15   waves to generate the image with sub-wavelength spatial resolution.

8. A method for generating a tomographic image of an object comprising

illuminating the object with a source of incident scalar waves, wherein the incident scalar waves are generated in a near-field illumination mode,

20   measuring scattering data from the object, wherein the scattering data is measured in a near-field collection mode and is related to the object by an integral operator, and

reconstructing the tomographic image by executing a prescribed mathematical algorithm, determined with reference to the integral operator, on the scattering data to produce the tomographic image with sub-wavelength spatial resolution.

5   9. The method as recited in claim 8 wherein the scattering data is related to the scattering potential of the object by the integral operator, and wherein the reconstructing includes reconstructing the tomographic image by executing the prescribed mathematical algorithm, determined with reference to the integral operator, on the scattering data, the prescribed mathematical algorithm further relating the scattering potential to the

10   scattering data by another integral operator.

10. A system for generating a tomographic image of an object comprising

a source for illuminating the object with incident scalar waves,

measurement means for measuring scattering data from the object,

15   wherein the scattering data is measured in a near-field collection mode and is related to the object by an integral operator, and

reconstruction means, responsive to the measurement means, for reconstructing the tomographic image by executing a prescribed mathematical algorithm, determined with reference to the integral operator, on the scattering data to produce the

20   tomographic image with sub-wavelength spatial resolution.

11. The system as recited in claim 10 wherein the scattering data is related to the scattering potential of the object by the integral operator, and wherein the reconstruction

means includes means for reconstructing the tomographic image by executing the

prescribed mathematical algorithm, determined with reference to the integral operator, on

the scattering data, the prescribed mathematical algorithm further relating the scattering

potential to the scattering data by another integral operator.

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12. A system for generating a tomographic image of an object comprising

a source for illuminating the object with incident scalar waves, wherein

the incident scalar waves are generated in a near-field illumination mode,

measurement means for measuring scattering data from the object,

10 wherein the scattering data is measured in the far-field of the object and is related to the

object by an integral operator, and

reconstruction means, responsive to the measurement means, for

reconstructing the tomographic image by executing a prescribed mathematical algorithm,

determined with reference to the integral operator, on the scattering data to produce the

15 tomographic image with sub-wavelength spatial resolution.

13. The system as recited in claim 12 wherein the scattering data is related to the

scattering potential of the object by the integral operator, and wherein the reconstruction

means includes means for reconstructing the tomographic image by executing the

20 prescribed mathematical algorithm, determined with reference to the integral operator, on

the scattering data, the prescribed mathematical algorithm further relating the scattering

potential to the scattering data by another integral operator.

14. A system for generating a tomographic image of an object comprising

a source for illuminating the object with incident scalar waves, wherein

the incident scalar waves are generated in a near-field illumination mode,

measurement means for measuring scattering data from the object,

5 wherein the scattering data is measured in a near-field collection mode and is related to

the object by an integral operator, and

reconstruction means, responsive to the measurement means, for

reconstructing the tomographic image by executing a prescribed mathematical algorithm,

determined with reference to the integral operator, on the scattering data to produce the

10 tomographic image with sub-wavelength spatial resolution.

15. The system as recited in claim 14 wherein the scattering data is related to the

scattering potential of the object by the integral operator, and wherein the reconstruction

means includes means for reconstructing the tomographic image by executing the

15 prescribed mathematical algorithm, determined with reference to the integral operator, on

the scattering data, the prescribed mathematical algorithm further relating the scattering

potential to the scattering data by another integral operator.

16. A method for generating a tomographic image of an object comprising

20 probing the object with incident electromagnetic waves,

detecting scattered waves from the object, wherein the scattered waves are

detected in a near-field collection mode, and

reconstructing the tomographic image by executing a prescribed

mathematical algorithm with reference to the incident electromagnetic waves and the

scattered waves to generate the tomographic image with sub-wavelength spatial

resolution.

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17. A method for generating a tomographic image of an object comprising

illuminating the object with a source of incident electromagnetic waves,

measuring scattering data from the object, wherein the scattering data is

measured in a near-field collection mode and is related to the object by an integral

10   operator, and

reconstructing the tomographic image by executing a prescribed

mathematical algorithm, determined with reference to the integral operator, on the

scattering data to produce the tomographic image with sub-wavelength spatial resolution.

15   18. The method as recited in claim 17 wherein the scattering data is related to the

dielectric susceptibility of the object by the integral operator, and wherein the

reconstructing includes reconstructing the tomographic image by executing the

prescribed mathematical algorithm, determined with reference to the integral operator, on

the scattering data, the prescribed mathematical algorithm further relating the dielectric

20   susceptibility to the scattering data by another integral operator.

19. A method for generating a tomographic image of an object comprising

probing the object with incident electromagnetic waves, wherein the

incident electromagnetic waves are generated in a near-field illumination mode,

detecting scattered waves from the object, wherein the scattered waves are

detected in the far-field of the object, and

5   reconstructing the tomographic image by executing a prescribed

mathematical algorithm with reference to the incident electromagnetic waves and the

scattered waves to generate the tomographic image with sub-wavelength spatial

resolution.

10   20. A method for generating a tomographic image of an object comprising

illuminating the object with a source of incident electromagnetic waves,

wherein the incident electromagnetic waves are generated in a near-field illumination

mode,

measuring scattering data from the object, wherein the scattering data is

15   measured in the far-field of the object and is related to the object by an integral operator,

and

reconstructing the tomographic image by executing a prescribed

mathematical algorithm, determined with reference to the integral operator, on the

scattering data to produce the tomographic image with sub-wavelength spatial resolution.

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21. The method as recited in claim 20 wherein the scattering data is related to the

dielectric susceptibility of the object by the integral operator, and wherein the

reconstructing includes reconstructing the tomographic image by executing the

prescribed mathematical algorithm, determined with reference to the integral operator, on the scattering data, the prescribed mathematical algorithm further relating the dielectric susceptibility to the scattering data by another integral operator.

5   22. A method for generating a tomographic image of an object comprising

probing the object with incident electromagnetic waves, wherein the incident electromagnetic waves are generated in a near-field illumination mode,

detecting scattered waves from the object, wherein the scattered waves are detected in a near-field collection mode, and

10   reconstructing the tomographic image by executing a prescribed mathematical algorithm with reference to the incident electromagnetic waves and the scattered waves to generate the image with sub-wavelength spatial resolution.

23. A method for generating a tomographic image of an object comprising

15   illuminating the object with a source of incident electromagnetic waves, wherein the incident electromagnetic waves are generated in a near-field illumination mode,

measuring scattering data from the object, wherein the scattering data is measured in a near-field collection mode and is related to the object by an integral

20   operator, and

reconstructing the tomographic image by executing a prescribed mathematical algorithm, determined with reference to the integral operator, on the scattering data to produce the tomographic image with sub-wavelength spatial resolution.

24. The method as recited in claim 23 wherein the scattering data is related to the

dielectric susceptibility of the object by the integral operator, and wherein the

reconstructing includes reconstructing the tomographic image by executing the

5   prescribed mathematical algorithm, determined with reference to the integral operator, on

the scattering data, the prescribed mathematical algorithm further relating the dielectric

susceptibility to the scattering data by another integral operator.

25. A system for generating a tomographic image of an object comprising

10   a source for illuminating the object with incident electromagnetic waves,

measurement means for measuring scattering data from the object,

wherein the scattering data is measured in a near-field collection mode and is related to

the object by an integral operator, and

reconstruction means, responsive to the measurement means, for

15   reconstructing the tomographic image by executing a prescribed mathematical algorithm,

determined with reference to the integral operator, on the scattering data to produce the

tomographic image with sub-wavelength spatial resolution.

26. The system as recited in claim 25 wherein the scattering data is related to the

20   dielectric susceptibility of the object by the integral operator, and wherein the

reconstruction means includes means for reconstructing the tomographic image by

executing the prescribed mathematical algorithm, determined with reference to the

integral operator, on the scattering data, the prescribed mathematical algorithm further relating the dielectric susceptibility to the scattering data by another integral operator.

27. A system for generating a tomographic image of an object comprising

5   a source for illuminating the object with incident electromagnetic waves, wherein the incident electromagnetic waves are generated in a near-field illumination mode,

measurement means for measuring scattering data from the object, wherein the scattering data is measured in the far-field of the object and is related to the

10   object by an integral operator, and

reconstruction means, responsive to the measurement means, for reconstructing the tomographic image by executing a prescribed mathematical algorithm, determined with reference to the integral operator, on the scattering data to produce the tomographic image with sub-wavelength spatial resolution.

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28. The system as recited in claim 27 wherein the scattering data is related to the dielectric susceptibility of the object by the integral operator, and wherein the reconstruction means includes means for reconstructing the tomographic image by executing the prescribed mathematical algorithm, determined with reference to the

20   integral operator, on the scattering data, the prescribed mathematical algorithm further relating the dielectric susceptibility to the scattering data by another integral operator.

29. A system for generating a tomographic image of an object comprising

a source for illuminating the object with incident electromagnetic waves, wherein the incident electromagnetic waves are generated in a near-field illumination mode,

measurement means for measuring scattering data from the object,

5   wherein the scattering data is measured in a near-field collection mode and is related to the object by an integral operator, and

reconstruction means, responsive to the measurement means, for reconstructing the tomographic image by executing a prescribed mathematical algorithm, determined with reference to the integral operator, on the scattering data to produce the

10   tomographic image with sub-wavelength spatial resolution.

30.   The system as recited in claim 29 wherein the scattering data is related to the dielectric susceptibility of the object by the integral operator, and wherein the reconstruction means includes means for reconstructing the tomographic image by

15   executing the prescribed mathematical algorithm, determined with reference to the integral operator, on the scattering data, the prescribed mathematical algorithm further relating the dielectric susceptibility to the scattering data by another integral operator.